

CLAIMS

What is claimed is:

1. A chromatic dispersion compensating apparatus, comprising:
a chromatic dispersion compensating module having a spectral unit receiving an input light and generating an output light having a predetermined wavelength, a light returning unit designed for the predetermined wavelength to return the output light to the spectral unit, and a position changing unit changing a relative position between the spectral unit and the light returning unit;
a storing unit storing predetermined position controlling amounts of the position changing unit, the position controlling amounts being used to generate a chromatic dispersion value for a certain wavelength; and
a position controlling unit operating the position changing unit based on one of the position controlling amounts in the storing unit corresponding to the predetermined wavelength of the output light and the chromatic dispersion value to thereby change the relative position between the spectral unit and the light returning unit in accordance with said one of the position controlling amounts.
2. The chromatic dispersion compensating apparatus of claim 1, wherein the position controlling unit comprises an arithmetic unit calculating the position controlling amount obtained from the storing unit.
3. The chromatic dispersion compensating apparatus of claim 1, wherein the storing unit stores predetermined temperatures of the spectral unit.
4. The chromatic dispersion compensating apparatus of claim 3, further comprising:
a heating unit heating the spectral unit;
a temperature detecting unit detecting a temperature of the spectral unit; and
a temperature controlling unit controlling the heating unit based on one of the temperatures stored in the storing unit corresponding to the predetermined wavelength of the output light and the chromatic dispersion value to reduce signal loss.
5. The chromatic dispersion compensating apparatus of claim 1, further comprising:
a heating unit heating the spectral unit;

a light branching unit branching the output light output from the spectral unit;
a light intensity measuring unit measuring an intensity of the branched output light; and
a temperature controlling unit controlling the heating unit to provide a maximum light intensity as measured by the light intensity measuring unit.

6. The chromatic dispersion compensating apparatus of claim 5, further comprising:
a temperature detecting unit detecting a temperature of the spectral unit; and
a temperature storing unit storing the temperature of the spectral unit when the temperature of the spectral unit changes due to the temperature controlling unit and the light intensity obtained from the light intensity measuring unit increases up to approximately the maximum value.

7. The chromatic dispersion compensating apparatus of claim 1, wherein the spectral unit generates the output light having a signal light with a first wavelength and a monitor light with a second wavelength and an angular dispersion the same as that of the signal light.

8. The chromatic dispersion compensating apparatus of claim 7, further comprising:
a heating unit heating the spectral unit;
a light extracting unit extracting the monitor light;
a light intensity measuring unit measuring an intensity of the extracted light; and
a temperature controlling unit controlling the heating unit to provide an approximately maximum light intensity as measured by the light intensity measuring unit.

9. The chromatic dispersion compensating apparatus of claim 1, wherein the spectral unit has a virtually imaged phased array (VIPA) with a plurality of passage areas for receiving and outputting light, receives the input light having a plurality of continuous wavelengths within the passage areas, and performs multiple reflections of the input light to form, through self-interference, output light comprising component lights that are spatially distinguished from one another, and thereby disperses the output light at different output angles, depending on each constituent wavelength, in a substantially linear dispersing direction.

10. The chromatic dispersion compensating apparatus of claim 9, further comprising:
a light returning unit comprising a lens focusing the output light formed with the VIPA and
a mirror that returns the focused output light to the lens through reflection and causes the lens

to return the reflected output light to the VIPA, thereby outputting the reflected output light from the VIPA via the passage areas by multiple reflections within the VIPA, and forming in a shape that provides an approximately constant wavelength dispersion to the output light from the VIPA independent of each constituent wavelength for the angular dispersion direction of the VIPA, and provides different wavelengths in a substantially perpendicular direction to the angular dispersion direction of the VIPA.

11. The chromatic dispersion compensating apparatus of claim 1, wherein the spectral unit generates the output light having a signal light with a first wavelength and a monitor light with a second wavelength having an angular dispersion the same as that of the signal light, wherein the wavelength of the monitor light is changeable.

12. The chromatic dispersion compensating apparatus of claim 11, further comprising:
 a heating unit heating the spectral unit;
 a light extracting unit extracting the monitor light;
 a light intensity measuring unit measuring an intensity of the extracted light; and
 a temperature controlling unit controlling the heating unit to control temperature according to a change in the intensity of the extracted light when the second wavelength of the monitor light is changed within a wavelength band containing the second wavelength.

13. The chromatic dispersion compensating apparatus of claim 7, wherein the monitor light comprises lights having a plurality of different wavelengths.

14. A controlling method of a chromatic dispersion compensating apparatus comprising a chromatic dispersion compensating module having a spectral unit receiving an input light and generating an output light having a predetermined wavelength, a light returning unit designed for the predetermined wavelength to return the output light to the spectral unit, and a position changing unit changing a relative position between the spectral unit and the light returning unit, the controlling method comprising:

designating the predetermined wavelength of the output light and a chromatic dispersion value;

obtaining a controlling amount of the position changing unit corresponding to the designated wavelength and the designated chromatic dispersion value; and

operating the position changing unit based on the obtained controlling amount to thereby

change the relative position between the spectral unit and the light returning unit in accordance with the controlling amount.

15. The controlling method of the chromatic dispersion compensating module of claim 14, further comprising:

calculating the controlling amount of the position changing unit corresponding to the designated wavelength and the designated chromatic dispersion value after said designating the predetermined wavelength and the chromatic dispersion value and before said obtaining the controlling amount corresponding to the designated wavelength and the designated chromatic dispersion value.

16. The controlling method of the chromatic dispersion compensating module of claim 14 further comprising:

storing, after said operating the position changing unit based on the obtained controlling amount, both an initial value of a temperature of the spectral unit and an initial value of an optical level as a temperature storing value and an optical level storing value, respectively;

heating the spectral unit through a heating process and storing an indicator of the heating process as a heating condition storing value;

determining whether a measured value of the optical level is greater than the stored optical level;

storing, respectively, both a measured value of temperature and the measured value of the optical level as a new temperature storing value and a new optical level storing value when the measured value of the optical value is greater than the stored optical level;

determining whether the heating condition storing value indicates the heating process;

heating, when the heating condition storing value indicates the heating process, the said spectral unit and storing the indicator of the heating process as the heating condition storing value and then repeating said determining whether a measured value of the optical level is greater than the stored optical level;

radiating the heat of the spectral unit through a heat radiating process and storing an indicator of the heat radiating process as the new heating condition storing value when the heating condition storing value does not indicate the heating process, and then repeating said determining whether a measured value of the optical level is greater than the stored optical level;

determining whether the heating condition storing value indicates the heating process when the measured value of the optical level is not greater than the stored optical level;

radiating, when the measured value of the optical value is greater than the stored optical level, the heat of the spectral unit and storing the indicator of the heat radiating process as the heating condition storing value, and then repeating said determining whether a measured value of the optical level is greater than the stored optical level; and

heating, when the heating condition storing value does not indicate the heating process, the spectral unit and storing the indicator of the heating process as the heating condition storing value, and then repeating said determining whether a measured value of the optical level is greater than the stored optical level.

17. The controlling method of the chromatic dispersion compensating module of claim 14, further comprising:

storing, after said operating the position changing unit based on the obtained controlling amount, an initial value of a temperature of the spectral unit as a first temperature storing value;

changing periodically the temperature of the spectral unit within a certain temperature range about the first temperature storing value;

storing periodically a measured value of the temperature and a measured value of the optical level;

comparing a temperature waveform changing with time based on the stored measured value of temperature and the optical level waveform changing with time based on the stored measured value of optical level;

determining whether a period of the optical level waveform changing with time is equal to twice a the period of the temperature waveform changing with time;

repeating said changing periodically the temperature of the spectral unit when the period of the optical level waveform is twice the period of the temperature waveform;

determining whether a phase of the optical level waveform changing with time matches a phase of the temperature waveform changing with time when the period of the optical level waveform is not twice the period of the temperature waveform;

storing a maximum temperature among the stored measured values of the temperature as a first temperature storing value and repeating said changing periodically the temperature of the spectral unit when the phase of the optical level waveform matches the phase of the temperature waveform; and

storing a minimum temperature among the stored measured values of the temperature as the first temperature storing value and then repeating said changing periodically the temperature of the spectral unit when the phase of the optical level waveform does not match

the phase of the temperature waveform.

18. A chromatic dispersion compensating module using a virtually imaged phased array (VIPA) that compensates for an error of a chromatic dispersion value generated depending on a predetermined wavelength based on previously stored information, and provides a minimum signal loss at the predetermined wavelength and the chromatic dispersion value.

19. A chromatic dispersion compensating apparatus, comprising:
 a chromatic dispersion compensating module having a spectral unit receiving an input light and generating an output light having a predetermined wavelength;
 a storing unit storing predetermined wavelengths used and predetermined chromatic dispersion values and temperatures of the spectral unit corresponding to the predetermined wavelengths used;
 a heating unit heating the spectral unit;
 a temperature detecting unit detecting a temperature of the spectral unit; and
 a temperature controlling unit controlling the heating unit based on one of the temperatures stored in the storing unit that corresponds to the predetermined wavelength of the output light and the chromatic dispersion value to reduce signal loss, to thereby maintain the spectral unit at a constant temperature and stabilize a chromatic dispersion value generated by the spectral unit.

20. A chromatic dispersion compensating apparatus, comprising:
 a chromatic dispersion compensating module having a spectral unit receiving an input light and generating an output light having a predetermined wavelength;
 a storing unit storing predetermined wavelengths used and predetermined chromatic dispersion values and temperatures of the spectral unit corresponding to the predetermined wavelengths used;
 a heating unit heating the spectral unit;
 a light branching unit branching the output light from the spectral unit;
 a light intensity measuring unit measuring an intensity of the branched output light;
 a temperature detecting unit detecting a temperature of the spectral unit; and
 a temperature controlling unit controlling the heating unit based on one of the temperatures stored in the storing unit that corresponds to the predetermined wavelength of the output light and the chromatic dispersion value to provide a maximum light intensity of the

output light, thereby maintaining the spectral unit at a constant temperature and stabilizing a chromatic dispersion value generated by the spectral unit.

21. A chromatic dispersion compensating apparatus, comprising:

a monitor light source generating a monitor light;

a chromatic dispersion compensating module having a spectral unit receiving an input light and the monitor light and generating an output light having a signal light with a first wavelength and the monitor light with a second wavelength, the monitor light having an angular dispersion the same as that of the signal light;

a heating unit heating the spectral unit;

a light extracting unit extracting the monitor light from the output light;

a light intensity measuring unit measuring an intensity of the extracted monitor light; and

a temperature controlling unit controlling the heating unit to provide a maximum light intensity of the monitor light, thereby maintaining the spectral unit at a constant temperature and stabilizing a chromatic dispersion value generated by the spectral unit.

22. A chromatic dispersion compensating apparatus, comprising:

a spectral unit receiving an input light and generating an output light having a predetermined wavelength;

a light returning unit designed for the predetermined wavelength to return the output light to the spectral unit, the light returning unit and the spectral unit operating together to produce chromatic dispersion; and

a controller changing the relative position between the spectral unit and the light returning unit based on a predetermined position controlling amount and a predetermined chromatic dispersion value corresponding to the predetermined wavelength.

23. The chromatic dispersion compensating apparatus of claim 22, wherein the spectral unit is a virtually imaged phased array (VIPA).

24. A chromatic dispersion compensating apparatus, comprising:

spectral means for receiving an input light and generating an output light having a predetermined wavelength;

light returning means for returning the output light to the spectral means, the light returning means and the spectral means operating together to produce chromatic dispersion;

and

means for changing the relative position between the spectral means and the light returning means based on a predetermined position controlling amount and a predetermined chromatic dispersion value corresponding to the predetermined wavelength.

25. The chromatic dispersion compensating apparatus of claim 24, wherein the spectral means is a virtually imaged phased array (VIPA).

26. A chromatic dispersion compensating apparatus, comprising:
a spectral unit receiving an input light and generating an output light having a predetermined wavelength;
a heating unit heating the spectral unit; and
a controller controlling the heating unit based on a detected temperature of the spectral unit that corresponds to the predetermined wavelength, to thereby maintain the spectral unit at a constant temperature and stabilize a chromatic dispersion value generated by the spectral unit.

27. The chromatic dispersion compensating apparatus of claim 26, wherein the spectral unit is a virtually imaged phased array (VIPA).

28. A chromatic dispersion compensating apparatus, comprising:
spectral means for receiving an input light and generating an output light having a predetermined wavelength;
heating means for heating the spectral unit; and
means for controlling the heating means based on a detected temperature of the spectral means that corresponds to the predetermined wavelength, to thereby maintain the spectral means at a constant temperature and stabilize a chromatic dispersion value generated by the spectral means.

29. The chromatic dispersion compensating apparatus of claim 28, wherein the spectral means is a virtually imaged phased array (VIPA).